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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/837,911	04/18/2001	Hui Wang	495152000111	9922
20872	7590	04/09/2004	EXAMINER	
MORRISON & FOERSTER LLP 425 MARKET STREET SAN FRANCISCO, CA 94105-2482			LEADER, WILLIAM T	
			ART UNIT	PAPER NUMBER

1742

DATE MAILED: 04/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/837,911

Applicant(s)

WANG, HUI

Examiner

William T. Leader

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 110-159 is/are pending in the application.
- 4a) Of the above claim(s) 142-159 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 110-141 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. Receipt of the response filed on January 7, 2004, is acknowledged. New claims 110-159 are pending.
2. Newly submitted claims 142-159 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: New claims 142-159 are related to original claims 113-118 as subcombinations usable together. The apparatus recited in claims 113-118 does not require all of the specific features recited in claims 142-159 and vice versa. For example, there is no requirement in claims 113-118 that a bath be divided by a first wall and at least a second wall.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 142-159 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 103

3. Claims 110-121, 124-127, 133-135, 137-139 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,882,498) in view of Fairbairn et al (6,176,667) and Andricacos et al (5,522,975).

4. Dubin et al and Fairbairn et al are applied as in the previous office action. Claims 110 and 113 have been amended to recite that the bath has a first wall which is adjacent to a first portion of the substrate and a second wall which is adjacent to at least a second portion of the substrate. This limitation is considered to be suggested by Fairbairn et al. As shown in figure 1 of Fairbairn et al, the apparatus includes robot arm 32 adapted to insert wafers into processing chambers A1 and A2 through slit valves 22. Any suitable semiconductor operation can be performed in these chambers (column 3, lines 28-30). Thus, the Fairbairn et al suggest that the electroplating step of Dubin et al could be performed in the chambers. The Andricacos et al patent is directed to electroplating onto an article such as a wafer immersed in an electrolyte bath. As shown in figure 1, the container for the bath includes pairs of opposed walls. One wall is adjacent to a first portion of the substrate while a second wall is adjacent to a second portion of the substrate as recited in claims 110 and 113. The apparatus of Andricacos et al is adapted to from a uniform deposit on the workpiece.

5. The prior art of record is indicative of the level of skill of one of ordinary skill in the art. It would have been obvious at the time the invention was made to have utilized stacked process chambers with a robot arm to transfer wafers as taught by Fairbairn et al to carry out the processes of plating and spin/rinse/drying disclosed by Dubin et al because less floor space would have been required, and to have

utilized a plating module including a bath like that of Andricacos et al because uniform plating would have been obtained.

6. Claims 119-121 and 133-135 recite flowing electrolyte in gaps between portions of the substrate first and second walls. Andricacos et al disclose a circulation system of the electrolyte. As shown in figure 2, the system includes a pump, filter, valves and interconnecting plumbing (column 3, lines 32-35) which cause the electrolyte to flow in gaps between the substrate and the walls. Claims 124-126 and 138-139 recite plating a seed layer in one module and plating a metal film on the seed layer in a second module. Dubin et al teach that typically, in the formation of metal interconnect structures on a semiconductor wafer, a barrier layer and a seed layer of metal is deposited on the wafer, then the wafer is then immersed into an electroplating process chamber containing an electrolyte solution (column 1, lines 19-23). The seed layer may be made of nickel, copper, cobalt, tin-lead alloy or equivalent metal (column 4, lines 4-9). The use of stacked chambers to perform the deposition of the seed layer in the process of Dubin et al would have been obvious because Fairbairn teaches the provision of a plurality of stacked modules and states that any suitable semiconductor operation can be performed in them. Since different metals may be deposited for the seed layer and electroplated layer, the use of different plating bath compositions is suggested.

7. With respect to claim 127 and 137, Dubin et al disclose the provision of drive motor 31 for rotating the substrate (column 4, lines 59-61).

8. Claims 122-123 and 130-132 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,882,498) in view of Fairbairn et al (6,176,667) and Andricacos et al (5,522,975) as applied to claims 110-121, 124-127, 133-135, 137-139 above, and further in view of Woodruff et al (6,497,801).

9. Claim 130 recites a first anode adjacent to a first wall and a second anode adjacent to a second wall. Claim 122 includes a similar limitation. The Woodruff et al patent is directed to electroplating onto semiconductors using a segmented anode array. As shown in figure 5, a plurality of anodes 34 is provided. Dielectric spacers or walls 46 may be provided between the anode segments. The anode segments can be independently operated to create varying electrical potentials (abstract). This independent control suggests the independent power supplies as recited in claims 132. It would have been obvious to have utilized at least two anodes with separating walls as taught by Woodruff et al because improved uniformity of the deposited metal would have been obtained.

10. Claims 128, 129, 140 and 141 rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,882,498) in view of Fairbairn et al (6,176,667) and Andricacos et al (5,522,975) as applied to claims 110-121, 124-127, 133-135, 137-139 above, and further in view of Kobayashi et al (5,925,227).

11. Claims 128, 129, 140 and 141 relate to movement of the substrate. As previously noted, Fairbairn et al discloses robot arm 32 to move the substrate. This arm moves the substrate in a horizontal plane. Applicant's claims recite vertical movement as well. The Kobayashi et al patent is directed to apparatus for processing semiconductor wafers. The apparatus includes a transfer arm which is capable of moving in a vertical direction as shown in figure 2. Figure 3 shows substrate support members 521 which are also capable of moving in a vertical direction. It would have been obvious to have included means for moving the substrate vertically as well as horizontally in the apparatus of Fairbairn et al. Because greater flexibility in the placement of the workpiece would have been obtained.

12. Claim 136 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dubin et al (5,882,498) in view of Fairbairn et al (6,176,667) and Andricacos et al (5,522,975) as applied to claims 110-121, 124-127, 133-135, 137-139 above, and further in view of the Electroplating Engineering Handbook. Claim 136 recites a temperature control. Chapter 22 of the Handbook is directed to heating and cooling equipment for use in electroplating apparatus. It would have been obvious to have provided a temperature control as recited in claim 136 because the Handbook shows temperature control equipment to be conventional and because optimum performance would have been obtained by controlling temperature.

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

14. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

15. Applicant's arguments with respect to claims 110-118 has been considered but are moot in view of the new ground(s) of rejection.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

Application/Control Number: 09/837,911
Art Unit: 1742

Page 8

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


William Leader
April 2, 2004


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SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700